

# Tetrameres proventriculitis and renal nematodiasis infection in Pelican from Melmaruvathur area of Tamil Nadu

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## ABSTRACT

**Background:** The study evidenced mortalities of Spot-billed Pelicans *Pelecanus philippensis* between December 2021 and January 2022 in Chengalpattu Districts of Tamil Nadu, especially at Melmaruvathur region near Vedanthangal reserve of Chengalpattu District Tamil Nadu, India.

**Objective /Case description:** The carcasses were floating in the water and were performed post-mortem and samples were collected and sent to the central university laboratory for further confirmation of the outbreak. 200 birds died in the ponds. Gross lesions recorded were worms seen embedded in the mucosa of the gizzard, congested lung, liver, and kidneys. Samples were collected from necropsy for routine diagnosis. Virological examination revealed the samples were negative for NDV by RT-PCR and Pasteurellosis by isolation and identification revealed pulmonary congestion and hemorrhages. The liver revealed diffuse congestion of veins and sinusoids with multifocal periportal MNC infiltration. The lumen of the proventricular gland revealed globular-shaped gravid female *Tetrameres* spp. High power view revealed thick-walled embryonated eggs in the uterus with first-stage larvae. Spleen revealed hemosiderosis. Kidneys revealed multifocal congestion and hemorrhages. Low-power examination of congested and hemorrhagic renal lobules with dilated medullary cones and ureters were noticed. High power examination revealed a cut section of numerous parasites. Parasites were mostly females with spines covering the tegument, a gravid uterus with numerous embryonated thick brown-walled operculated eggs consistent with the morphology of nematode *Paratanaisia* spp.

### Conclusion

The histopathological findings in the proventricular and urinary tissue of infected birds suggested that *Tetrameres* spp. *Paratanaisia* species in heavy loads have the pathogenic potential to cause mortality in naturally infected free-living Pelican birds.

**Keywords-** *Tetrameres*, *Paratanaisia*, Pelican, outbreak, Tamil Nadu

## INTRODUCTION

Pelican is a wild water bird that belongs to the family Pelecanidae. They are characterized by a long beak and a large throat pouch used for catching prey and draining water from the scooped-up contents and pale plumage, except for the brown and Peruvian pelicans. The widespread cause of death among wild water birds might be due to natural infections viral and bacterial, parasites, and malicious poisoning in their territory induced by human beings [1]. The massive outbreak was recorded in Dalmatian pelicans, brown pelicans, and American white pelicans due to internal parasites [2, 3]. Tetrameres are endemic in worldwide [4-5]. Proventriculitis is the predilection site of the parasites where male parasites are buried in the glands. The lifecycle involved the arthropods are intermediate hosts. The pelican is the definitive host that gets infection by swallowing the intermediate host immediately after ingestion they migrate into the proventriculus and copulate in the lumen of the organ [6]. Tetrameres are found principally in waterfowl and wild geese in various

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parts of the world; however it occurs in domestic duck, pigeon, fowl, turkey, guinea fowl, and quails in all over the world [7]. *Paratanaisia* are digenetic eucotylid parasites that affect several bird species of the upper urinary tract of Pelican, the organs where low regenerations are possible leading to mortality and massive death in the infected population [8]. The gross pathological changes in affected such as alteration in shapes, size, and discoloration in proventriculus and Kidney respectively due to *Tetrameres* Spp. and *Paratanaisia* Spp. parasites. Histopathologically, atrophy of glandular tissues, leakages of lumens and the massive presence of inflammatory cells, and dilatations of collecting ducts in the proventriculus

and kidney respectively has been reported by several workers [9, 10]. In India, pelicans were distributed but no mortality was reported except in Tamil Nadu, Assam and Andhra Pradesh recorded one bird death in each outbreak respectively [11, 12] due to endoparasites of *Contraecum* spp. The current report confirmed and discussed the outbreak of Tetrameres and renal nematodiasis infection in Pelican birds in the Chengalpattu District of Tamil Nadu by clinical symptoms, gross pathology, and histopathology.

### Case description

A total of 200 pelican birds have died of and floated in the water banks of Melmaruvathur Pond in the Chengalpattu District, Tamil Nadu, India. The village is well-known place for large colonies of pelican birds at all times. The outbreak was recorded during April- May month of 2021 and necropsied during this period continuously for 5 days. We have collected all the dead birds' floating in water bodies. Clinical investigations were recorded. Every day, one local person is allotted to notify the occurrence of health. If noticed any sickness of birds, like dropping necks and decomposing of birds and noticed to local veterinary doctors. Birds which are showing symptoms of sickness were collected and taken to the cage and provided with fish and treated for parasitism with antiparasitic drugs, vitamins, and electrolytes, although, no birds were recovered. Morbidity, Mortality, and postmortem findings were recorded. Tissue samples such as liver, gizzard, proventriculus, heart, spleen, and kidney were collected for further examination and confirmatory diagnosis of the disease.

For the identification of Tetrameres parasite's proventricular contents were washed with saline water and examine under a microscope. The nodules and lacerated lesions were incised to reveal the presence of parasites the identified using concept of helminthology. Identification of nematode from kidney, the cut section of the kidney were washed with saline and examined under microscopic for the presence of oocyst and parasites.

Histopathological examination, the samples were collected in 10% formalin saline. The routine paraffines embedding techniques were employed for histopathological study and 5-10 micrometer tissue section and hematoxylin and eosine staining procedure [13].

### Results

The representative of the village of the ponds reported mortality of around 200birds in a short span of 10 days. The outbreak was characterized by the observation of sudden death and floating in the water bank. The infected birds showed the clinical signs of inappetence, dullness, watery brown color diarrhea and incoordination to move. Not able to stand and fly and extension of neck also noticed. Paralysis is also noticed in the end of the death stage (Fig-1).



Fig.1 Dead birds showing extended neck



Fig.2 Presence of worm in trachea



Fig.3 Enlarged kidney with Paratanasia Spp. worms



The gross pathological findings involved congestion, a wide spread of hemorrhages on the visceral organ like lungs, heart, liver, pancreas, spleen, kidney, and intestine. The lumen of the gizzard and proventriculus showed enlargement, ulceration, and nodular structure with brownish digested material and blood. The birds showed the presence of worms in the gizzard

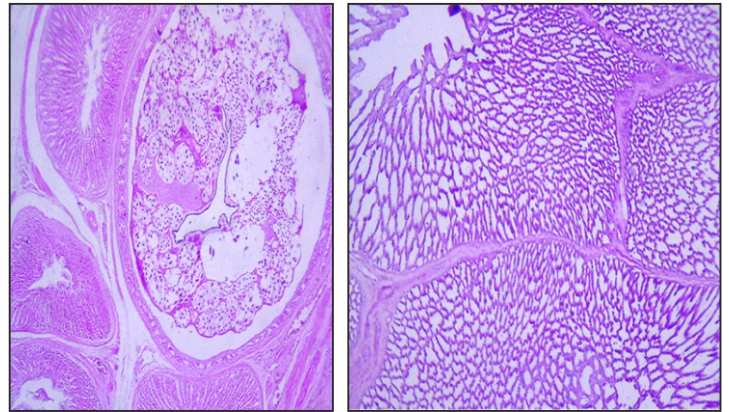


and proventriculus. Trachea showed the presence of hemorrhages and the esophagus revealed severe hemorrhages with live worms (Fig.2). Kidney enlarged and white color worms were noticed (Fig-3). The parasite in pelican birds of proventriculus lumen of the gland revealed globular shaped gravid female Tetramere spp. (Fig-4). In high power, resolution revealed thick wall embryonated eggs with first-stage larvae. In kidney revealed the presence of numerous parasites in the cut section (Fig.5) parasites noticed the presence of spine covering the tegument, and gravid uterus with numerous embryonated thick walled operculated eggs consistent with Paratania spp. of nematodes. The cut section of the other organ not revealed the presence eggs and parasites.



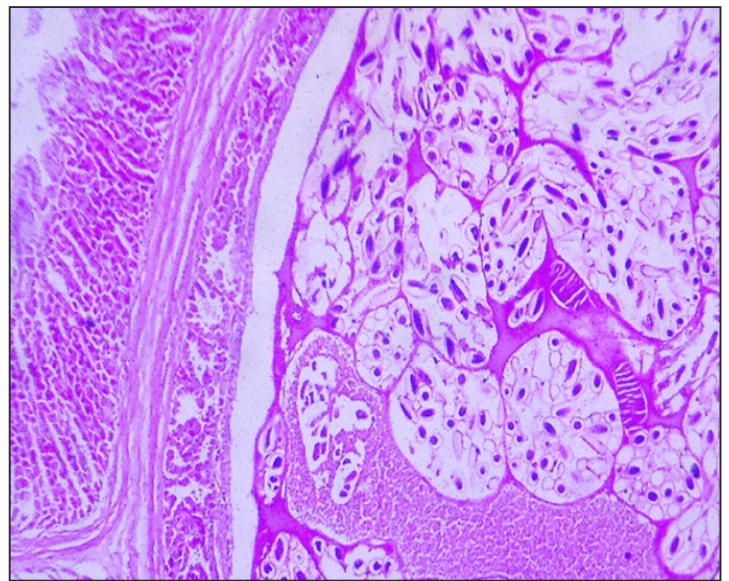
**Fig.4 Proventriculus haemorrhages with Tetrameres Spp. worms**

**Fig.5 Histopathology of Proventriculus showing presence of Tetrameres Spp. worms**



**Normal Proventriculus**

**Globular shaped gravid female Tetrameres spp**

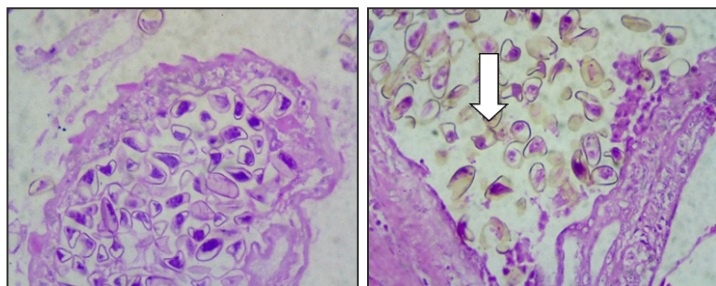


**Numerous thick walled embryonated eggs in the gravid uterus with first-stage larvae**

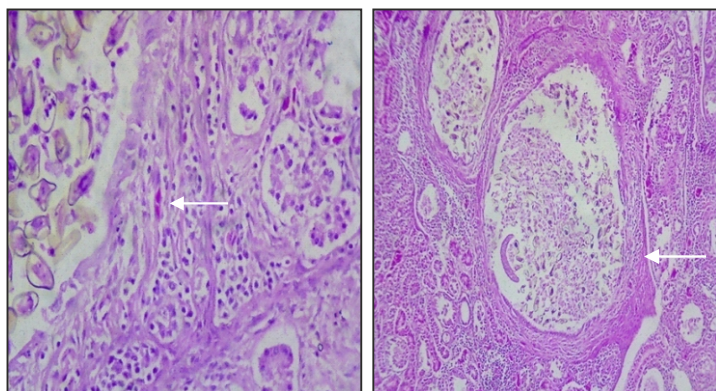
Histopathology examination revealed the presence of glandular lumen dilatation and atrophy of gland with minimal inflammatory reaction in the proventriculus (Fig-5). The kidney showed multifocal congestion and hemorrhages (Fig-6). In low power examination congested and hemorrhagic renal lobules with dilated medullary cones and ureters. Internal inflammatory reactions were evident with numerous mononuclear cells (MNC) infiltration and fibrous tissue proliferation. The liver revealed diffused congestion of veins and sinusoids with multifocal periportal MNC. Spleen revealed haemosiderosis. Virological examination ruled out negative for Newcastle diseases virus by RT-PCR and bacteriological examination negative for P. multocida examination. For exploring the possible cause of the toxicity by heavy metals and pesticides from the water samples, the samples showed negative both the toxins and pesticide pollution. Therefore, these findings promised us to explore cause of the mortality by gastrointestinal parasites.

**Fig.6 Histopathology of a kidney showing presence of nematode ParataniaSpp. and renal inflammatory changes**





**Eggs consistent with the morphology of nematode Paratania Spp.**



**Renal inflammatory outpour**

## DISCUSSION

Melmaruvathur Pond is small freshwater pond in the Chengalpattu District of Tamil Nadu, India. The pond is located near Vedanthangal Birds sanctuaries. The pond is almost equal to sea level. It has a maximum depth of 3 meters, a length of 1 km and a breadth of ½ km. Melmaruvathur pond is a sustainable water-holding pond in all the seasons in which the migratory waterfowls have been reported to harbor Tetrameres spp. and Paratania spp.

Clinical signs recorded in this outbreak in accordance with the finding of [14, 15]. The outbreak observed and witnessed sudden mortalities during April-May 2021 also revealed the presence of Tetrameres spp. and Paratania spp. The prevalence and death has been reported in pelican birds with Tetrameres spp. and Paratania spp. as high as 60% [16] and described in several species wild birds. Proventriculus can be infected with Tetramere in 82 % and Kidney infected with 50% Paratania spp. [17]. Tetramere causes glandular atrophy and inflammatory changes in the proventriculus and gizzard. Many researchers reported Tetrameres parasites present without showing any symptoms and causing death in wild birds but the outbreak in this study noticed high mortality rate due to combined infection of other parasitic infections.

Microscopic examinations observed alterations in renal lobules with dilated medullary cones and ureters firmly by the pathogenesis of the parasites. The previous reports of [18, 19] were observed inflammatory changes in the renal tubules with glomerular alterations, hemorrhages, necrosis and fibrosis. The study notable to confirms the parasitic alterations in the kidney as due to parasitic interferences and they were caused by the nutritional cause, condition of the host and convalescent and concomitant infection. The outbreak was also not able to elaborate cause of the infection or the sick or by infected with parasites or extended pathological changes caused by the parasites. Based on the morphological character and oocyst

identification parasite identification is a difficult job. But, the Paratania spp. can be accurately identified by the presence of teguments and spine and scales covering the teguments [20]. The present findings suggested that Tetrameres spp and Paratania spp. might be prevalent in the pelican birds in Melmaruvathur and may be caused severe infection and damage the internal organs and immune systems of the host therefore the parasite may be acted as the predisposing factor to other infectious diseases which cannot be ruled out in this study.

## CONCLUSION

In the present study, Tetramere spp. and Paratania spp. manifestation recorded in pelican birds of Melmaruvathur. Here, we suggest that to treat endoparasites in wild water birds like pelican birds coordinated and integrated program is needed with all the departments such as local people, Animal husbandry department, forest department, wildlife department, irrigation, and fisheries department. The gross pathology and histopathology of the proventriculus and urinary tissues indicate that the identified parasites might be causing the potential damage to the other wide range of hosts rearing under intensifying systems of rearing such as desichicken and ducks.

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